A NOTE ON 222 KeV GAMMA-RAY TRANSITION IN THE DECAY OF Ba ^{133*}

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The electron capture decay of Ba^{133} has been investigated by a number of workers, Crasemann (1957) Fagg (1958) Gupta (1958) Stewart (1960) Ramaswamy (1960) Mann (1963) and Thun (1966). Most of these authors are in accord concerning the existence of all the gamma-ray transitions, shown in fig. 1, except the one of energy 222 KeV. This gamma-ray transition was originally observed by Steward and Lu (1960) but could not latter on be detected by Ramaswamy (1960)

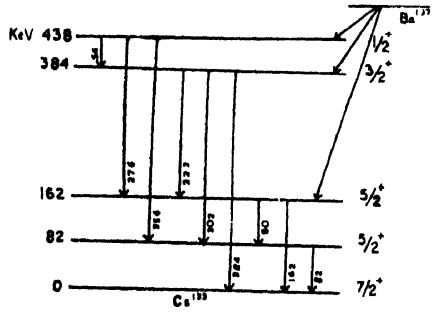

Fig. 1. Decay Scheme of Ba^{133}

and Mann (1963). The relative intensity of this gamma-ray has been estimated by Steward and Lu (1960) to be 0.3% as compared to 356 KeV gamma-ray. Because of the weak intensity of this gamma-ray it could not be possible to confirm the existence of this gamma-ray and make any measurement on it by ordinary single or coincidence scintillation spectrometer or even with solid state detectors. In this prsent study a high efficiency sum-peak coincidence spectrometer of Kantele (1962) has been employed and it has been possible to confirm the existence of 222 KeV gamma-ray transition and to measure its relative intensity.

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Measurement and Results

The high efficiency sum-peak coincidence spectrometer has been described in detail elsewhere by Kantele (1962). Two 3″×3″ NaI(Tl) detectors were placed at 90° to each other and a compton shield was put in between them at 45° to avoid crystal-to-crystal scattering. The data was recorded on a 256 channel RCL analyser. The effective resolving time of the fast coincidence circuit was 100 *n*-secs. The integral biases were set at about 140 KeV on each side to completely bias out 80 and 82 KeV gamma-rays. The sum-peak coincidence spectrum was thus run for 10 hours. The random coincidences were also run for the same period by introducing a delay of 500 *n*-secs in one of the fast channels. After substracting the random coincidence contribution the sum-peak coincidence spectrum is shown in fig. 2. This final spectrum predominently shows two peaks one at 445 KeV which arises because of the summing of 162 and 276 KeV gamma-rays and the

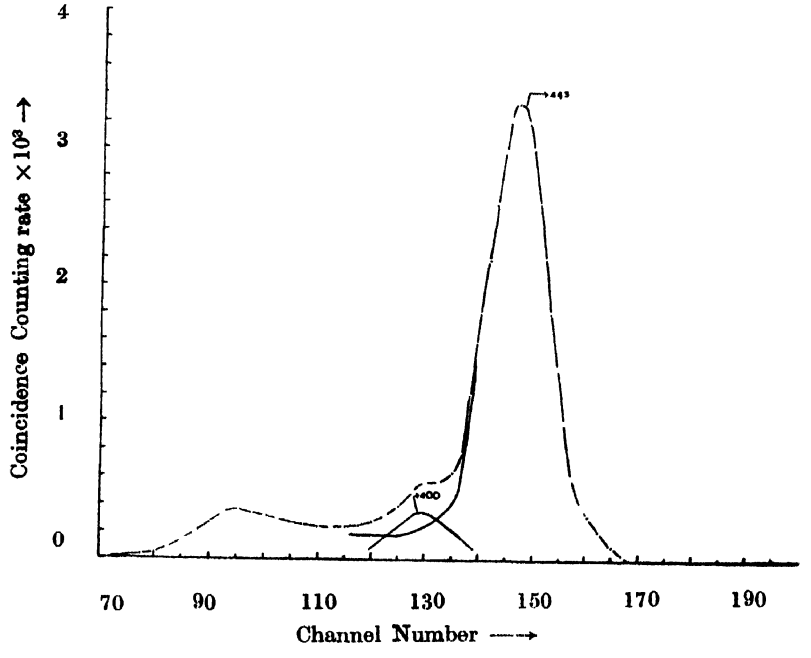

Fig. 2. Sum Peak coincidence spectrum of Ba^{133} taken with integral bias settings of 140 KeV.

second peak at 400 KeV is interpreted as the sum of 222 and 162 KeV gamma-rays cascade present in the decay of Ba^{133}. In both cases the sum peak energies are higher than the actual sum by the expected amount (Kantele *et al*, 1961). It is, therefore, concluded that there is 222 KeV gamma-ray present in the decay of Ba^{133} and since this gamma-ray is in coincidence with 162 KeV gamma-ray, therefore it originates from 384 KeV level and leads to 162 KeV level.

The relative intensity of this gamma-ray comes out to be 10.3% as compared to 162 KeV gamma-ray. The relative intensity of 162 KeV gamma-ray has been

measured by Mangal *et al*, to be 2.8% as compared to 356 KeV gamma-ray. Therefore, the relative intensity of 222 KeV gamma-ray relative to 356 gamma-ray comes out to be 0.28 ± 0.03. The error includes the summing effect of the K-x ray which is in coincidence with all the gamma-ray transmitions because of the electron capture decay of Ba^{133}.

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THERMOELECTRIC POWER OF TUNGSTENITE (WS_2) SINGLE CRYSTALS

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Thermoelectric power of naturally occuring single crystals (hexagonal) of tungstenite (WS_2) have been measured against copper along both the crystallographic directions and over the temperature range 300°K to 820°K. The results of preliminary measurements are shown in table 1 and in figures 1 and 2.

It is observed from the table I, that at the vicinity of room temperature the thermoelectric powers of crystals 1 and 3 are positive in both the crystallographic directions while that of crystal 2 is negative in these directions. The magnitude of thermoelectric power at room temperature which varies from sample to sample (evidently due to differences in the impurity contents which however has not been analysed) has been found to be slightly different in different crystallographic direc-